FORM-PTO-1390 (Rev. 12-29-99) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 024444-954

U.S. APPLICATION NO. (If known, see 37 C.F.R 1 5): 09/913508

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE00/00262	10/02/2000 10 FEBRUARY 2000	15/02/1999 15 FEBRUARY 1999

TITLE OF INVENTION: CUTTING INSERT FOR TURNING

APPLICANT(S) FOR DO/EO/US: Jörgan WIMAN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☒ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

PUBLICATION WO 00/47405

518 Rec'd PCT/PTO 15 AUG 2001

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 09/913508	INTERNATIONAL APPLICATION NO. PCT/SE00/00262	ATTORNEY'S DOCKET NUMBER 024444-9540

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1,000.00 (960)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $860.00 (970)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $710.00 (958)		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) $690.00 (956)		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00 (962)		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 1,000.00	
Surcharge of **$130.00 (154)** for furnishing the oath or declaration later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(e)).	$ ---	

Claims	Number Filed	Number Extra	Rate		
Total Claims	7 -20 =	---	X$18.00 (966)	$ ---	
Independent Claims	1 -3 =	---	X$80.00 (964)	$ ---	
Multiple dependent claim(s) (if applicable)			+$270.00 (968)	$ ---	
TOTAL OF ABOVE CALCULATIONS =				$ 1,000.00	
Reduction for 1/2 for filing by small entity, if applicable (see below).				$ ---	-
SUBTOTAL =				$ 1,000.00	
Processing fee of **$130.00 (156)** for furnishing the English translation later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ ---	
TOTAL NATIONAL FEE =				$ 1,000.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 (581)** per property +				$ ---	
TOTAL FEES ENCLOSED =				$ 1,000.00	
				Amount to be: refunded	$
				charged	$

a. ☐ Small entity status is hereby claimed.

b. ☒ A check in the amount of $ 1,000.00 to cover the above fees is enclosed.

c. ☐ Please charge my Deposit Account No. 02-4800 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

d. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Ronald L. Grudziecki, Esq.
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

SIGNATURE

Alan E. Kopecki
NAME

25,813
REGISTRATION NUMBER

(01/01)

09/913508
518 Rec'd PCT/PTO 15 AUG 2001

Patent
Attorney's Docket No. **024444-954**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
JÖRGEN WIMAN	)	
	)	**BOX PCT/US**
Application No. [Not Assigned]	)	
International PCT/SE00/00262	)	
	)	
I.A. Date: February 10, 2000	)	
	)	
For: CUTTING INSERT FOR TURNING	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination please amend the above-captioned application as follows.

IN THE DESCRIPTION

Please replace the original description (pages 1-5) with the substitute description attached hereto.

Insert the abstract presented herewith on a separate sheet.

IN THE CLAIMS

Cancel claims 1-7 without prejudice or disclaimer and insert new claims 8-14 as follows:

8. (New) An indexible cutting insert having a polygonal shape and including an upper surface, a lower surface, and an edge surface structure interconnecting the upper and lower surfaces; an intersection between the edge surface structure and the top surface forming: a main cutting edge, a secondary cutting edge, and a

curved corner region disposed between the main and secondary cutting edges; the corner region including a radial edge and a corner edge of mutually different radii of curvature, wherein the radial edge and the secondary cutting edge are disposed on a first side of a bisector of the corner region, and the corner edge and the main cutting edge are located on a second side of the bisector; a radius of curvature of the radial edge being at least five times larger than a radius of curvature of the curved edge; the top surface including an edge-reinforcing land extending along the radial edge and the curved edge, a portion of the land extending along the radial edge being of smaller width than a portion of the land extending along the curved edge.

9. (New) The insert according to claim 8 wherein the land further includes a portion extending along the secondary cutting edge and being of the same width as the portion of the land extending along the curved edge.

10. (New) The insert according to claim 8 wherein the width of the land portion extending along the radial edge is 50-70% of the width of the land portion extending along the curved edge.

11. (New) The insert according to claim 8 wherein the corner region includes a planar inclined surface that is recessed in relation to the radial edge and the curved edge, the planar inclined surface including generally sine-wave-shaped edge portions disposed on opposite sides of the bisector and generally converging outwardly away from a center of the insert.

12. (New) The insert according to claim 11 wherein the planar inclined surface further includes a substantially straight primary edge portion extending substantially parallel to the radial edge and situated on the same side of the corner bisector as the radial edge.

13. (New) The insert according to claim 12 wherein the planar inclined surface further includes a straight secondary edge portion intersected by the corner bisector and intersecting the primary edge portion to define an obtuse angle therewith.

14. (New) The insert according to claim 13 wherein the bisector intersects the secondary edge portion substantially at a midpoint thereof.

REMARKS

A Substitute Description is being submitted to make minor changes. No new matter has been introduced.

Also enclosed is a version of the substitute description in which the amendments are shown with bracketing and underlining.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By _____
Alan E. Kopecki
Registration No. 25,813

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

Date: August 15, 2001

Abstract of the Disclosure

An indexible cutting insert includes a main cutting edge, a secondary cutting edge, and a curved corner region disposed between the main and secondary cutting edges. The corner region includes a radial edge and a corner edge. which edges are of mutually different radii of curvature. The radial edge and the secondary cutting edge are disposed on a first side of a bisector of the corner region. The corner edge and the main cutting edge are located on a second side of the bisector. A radius of curvature of the radial edge is at least five times larger than a radius of curvature of the curved edge.

Patent
Attorney's Docket No. **024444-954**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)
)
JÖRGEN WIMAN)
)
Application No. [Not Assigned])
International PCT/SE00/00262)
)
I.A. Date: February 10, 2000)
)
For: CUTTING INSERT FOR TURNING)

BOX PCT/US

REQUEST FOR DRAWING AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Approval is requested for amending FIG. 3 by changing the numeral "22" located at the left side of the figure to -- 22' -- as marked in red on the attached copy thereof.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: _____
Alan E. Kopecki
Registration No. 25,813

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

Date: August 15, 2001

CUTTING INSERT FOR TURNING

Background of the Invention

The present invention relates to an indexable insert for turning which cutting insert has a polygonal basic form including an upper surface, and a bottom surface. The top and bottom surfaces are interconnected by side surfaces, wherein at least a part of the intersection lines between the side surfaces and the upper surface forms at least one main cutting edge, a secondary cutting edge and a curved corner cutting edge therebetween.

For copy turning nowadays, to a large extent, indexable inserts are used with nose point angles below 60°, wherein an ordinary value [on] of the nose point angles is 55°, which enables application of the cutting inserts within a broad range. On the market nowadays a number of different types of indexable inserts with 55° nose point angle are found, among which types rhomboidic, rhombic and regular triangular indexable inserts can be mentioned.

In copy turning the following properties regarding feature and economy are desirable:

1) Good chip control, i.e. favourable chip guidance and chip breaking.

2) No movement of the cutting insert under impact of cutting forces.

When copy turning inwards in certain materials or in slender work pieces and also in usage on unsteady machines and in internal metal working, low cutting forces and preferably a positive chip angle on the copying insert are also desirable. Simultaneously there is a demand in modern machines that the copy turning insert to be used will be able to give the best possible surface finish of the machined surface. Sometimes the

surface finish can be improved by using higher cutting speed and neutral or positive rake angles.

Objects and Summary of the Invention

It is a first purpose of the invention to achieve a new and improved indexable insert for copy turning having a new type of wiper edge in the corner region which enables attainment of improved surface finish of the machined surface.

It is a second purpose to achieve an insert with a rake face in the corner area that brings about a favourable influence on the cutting force and the tool wear.

It is a third purpose to achieve an insert that is modified such that it enables increased feed whilst maintaining good surface finish.

The present invention relates to an indexible cutting insert having a polygonal shape and including an upper surface, a lower surface, and an edge surface structure interconnecting the upper and lower surfaces. An intersection between the edge surface structure and the top surface forms: a main cutting edge, a secondary cutting edge, and a curved corner region disposed between the main and secondary cutting edges. The corner region includes a radial edge and a corner edge of mutually different radii of curvature. The radial edge and the secondary cutting edge are disposed on a first side of a bisector of the corner region. The corner edge and the main cutting edge are located on a second side of the bisector. A radius of curvature of the radial edge is at least five times larger than a radius of curvature of the curved edge. The top surface includes an edge-reinforcing land extending along the radial edge and the curved edge. A portion of the

land extending along the radial edge being of smaller width than a portion of the land extending along the curved edge.

Brief Description of the Drawings

The invention will be described in more detail in the following with reference to the enclosed drawings, wherefrom the features of the invention will become apparent.

Fig. 1 is a plan view of a portion of an indexable insert according to the invention.

Fig. 2 is a side view of the cutting insert in Fig. 1.

Fig. 3 is an enlarged detailed view of the corner of an insert according to Figs. 1-2.

Fig. 4 is a view showing a tool with the cutting insert of Figs. 1-3 during copy turning inwards of a work piece.

Fig. 5 shows a sectional view along the line V-V in Fig. I and

Fig. 6 is a sectional view along the line VI-VI in Fig. 1.

Detailed Description of Preferred Embodiment of the Invention

Figs. 1-3 show a cutting insert 10 for copying turning according to the invention with triangular basic form. The cutting insert is generally made of cemented carbide but can also be made of other ceramic materials. The insert comprises flat top and bottom surfaces 11 and 12, which are mutually parallel and which form a right angle with the edge surfaces which are designated 13, 14 and 15 and interconnected by curved corner portions. In the embodiment shown in Figs. 1-3 each of the edge surfaces [are] is oriented in a plane perpendicular to the [plane that includes] planes that include the flat surfaces 11 and 12. The insert additionally includes a

plurality of cutting edges 18, 19[,] which provide intersections between the edge surfaces 13, 14, 15 and the top surface 11. The insert can alternatively have positive basic shape wherein the edge surfaces intersect with the top surface at an acute angle. The insert has a central hole 16 for the receipt of a pin or a centre screw (not shown) for the clamping of the insert into a belonging tool holder 17 (Fig. 4).

In Fig. 3 [1] the edge [surface extending towards an acute-angled corner are designated 13 and 14, with the embodiment shown in Fig. 1 the edge] 18 represents a secondary cutting edge and the edge 19 represents a main cutting edge between which there [then] is an asymmetric curved corner region including a radial edge 20 on one side of the bisector B intended to serve as a wiper edge and on opposite side of said bisector there is a corner edge 21 adjacent to the main cutting edge 19. It is to be understood that the insert must have such inclination that a clearance angle is obtained at the main [cutting edge and at the] and secondary cutting edges 18, 19 and at the corner region therebetween. This will enable the edge portion 20 to be used as an edge for inwards copying such that when facing at for example 90° a large cut can be taken while the length of the edges 18 need not be specifically great. The insert is provided at all cutting edge portions [provided] with a land 22 which extends all around the insert whilst oriented substantially perpendicular towards the edge surface 13, 14, 15.

According to the invention the radial edge 20 is provided with a [size of] radius that is at least five times larger than the size valid for the corner edge 21 located on the opposite side of said bisector B, said corner edge being a transition to the main cutting edge 19. A further characteristic

feature is that the main cutting edge 19 extends in a longitudinal direction such that it includes an angle of 80-135° together with radial edge 20.

The transition between the primary radial edge 20 and the corner edge 21 is in the form of a secondary radial edge 23, the size of which ought to [be] have a radius less than that of the radial edge 24 that represents a transition between the primary radial edge 20 and the secondary cutting edge 18. The relation should preferably be such that the size of the radius of radial edge 23 is about half the size of the radius of radial edge 24 located next to the secondary edge 18. At the same time, a transition radial edge 25 ought to be provided between the corner edge 21 and the main cutting edge 19, the radius of which ought to be of same size as the size of the radius of radial edge 24 located next to the secondary edge 18. As regards the width of the land 22 along radial edge 20 and along the remainder of the insert, it has been found suitable to select the width of the portion of said land 22 that extends along radial edge 20 such that it amounts to 50-70 % of the width of the portion of the land 22 that extends along the corner cutting edge 21.

A sloping surface or downwards inclined surface 26 extends from the inner limiting edge of each land 22 and extends into a secondary sloping surface 27 which is located at the corner area. This secondary sloping surface 27 extends into a planar central floor surface 28 of triangular basic shape [whilst] while oriented plane parallel with the bottom face 12 of the insert. The angle of inclination a of said sloping surface 26 ought to be in the [area] range of 10-30° whereas the angle of inclination of the secondary sloping surface 27 ought to be 0-15°.

Each land 22 is planar and includes a raised land area, which in a direction away from the corner area extends into an inclined land area. A characteristic feature of the invention is that said land area 22 includes an

area 22' with smaller width along the radial edge 20 which then successively appears with larger width which is uniform both along the corner cutting edge 21 as well as along the entire main cutting edge 19. At the same time as this brings about a purposeful enforcement of the cutting edge, this simultaneously enables reducing the contact between the chips and the insert's surface such that the crater wear effect can be timely deferred.

In order to furthermore improve chipbreaking and [deflecting] deflection of the chip obtained during turning and copying, a chip former is provided in the corner region. This chipformer is provided in the shape of an inclined plateau 27 that is depressed in relation to the edge portions, the confining side surfaces of which converge towards the corner with an asymmetric configuration in relation to the bisector. More specifically the shape is such that an essentially [sine-formed] sine wave-shaped side edge 29 located on same side of the bisector B as the primary radial edge 20 gets a termination in the form of an inclined primary edge 30. That edge 30 [which] extends parallel with the radial edge 20 and then provides an obtuse angled corner 31 and then extends into a secondary edge 32 in the opposite direction whereby said bisector B intersects said latter edge approximately in the middle thereof. The last mentioned secondary edge 32 provides in its turn an obtuse angled corner 33 together with the forward termination of another mainly [sine-formed] sine wave-shaped side edge 34 which represents a side confining edge of the plateau 27.

Thanks to the above defined radial differentiation in the corner region of the insert a surprisingly good surface smoothness of the machined surface has been achieved in comparison with a similar insert of constant corner radius, and the insert has additionally been found less sensible to how the setting angle is provided compared with a corresponding insert with

a straight wiper edge. Due to the above optimized shape of the chipformer in combination with the shape of said land 22 it has simultaneously been possible to increase the feed [with] by 20-100% whilst maintaining the profile depth of the generated surface.

In Fig. 4 it is shown how the illustrated embodiment of the insert is used for copying inwards with the insert clamped into [a belonging] an associated toolholder 17 whereby the direction of machining is designated P on the workpiece A.

In order to achieve optimized chip control the radii of the various radial edges should lie in the following intervals:

20: 5-30 mm, preferably 10-20 mm

21: 0.2-3.2 mm, preferably 0.4-1.6 mm

23: 0.2-1.6 mm, preferably 0.4-1.2 mm

24: 0.6-2.4 mm, preferably 0.8-1.6 mm

25: 1.6-30 mm, preferably 5-20 mm

PTO/PCT 09/913508
Rec'd 15 AUG 2001
PCT/SE00/00262

Cutting insert for turning

The present invention relates to an indexable insert for turning which cutting insert has a polygonal basic form including an upper surface, and a bottom surface interconnected by side surfaces, wherein at least a part of the intersection lines between the side surfaces and the upper surface forms at least one main cutting edge, a secondary cutting edge and a curved corner cutting edge therebetween.

For copy turning nowadays, to a large extent, indexable inserts are used with nose point angles below 60°, wherein an ordinary value on the nose point angles is 55°, which enables application of the cutting inserts within a broad range. On the market nowadays a number of different types of indexable inserts with 55° nose point angle are found, among which types rhomboidic, rhombic and regular triangular indexable inserts can be mentioned.

In copy turning the following properties regarding feature and economy are desirable:

1) Good chip control, i.e. favourable chip guidance and chip breaking.
2) No movement of the cutting insert under impact of cutting forces.

When copy turning inwards in certain materials or in slender work pieces and also in usage on unsteady machines and in internal metal working, low cutting forces and preferably a positive chip angle on the copying insert are also desirable. Simultaneously there is a demand in modern machines that the copy turning insert to be used will be able to give the best possible surface finish of the machined surface. Sometimes surface finish can be improved by using higher cutting speed and neutral or positive rake angles.

It is a first purpose of the invention to achieve a new and improved indexable insert for copy turning having a new type of wiper edge in the corner region which enables attainment of improved surface finish of the machined surface.

It is a second purpose to achieve an insert with a rake face in the corner area that brings about a favourable influence on the cutting force and the tool wear.

It is a third purpose to achieve an insert that is modified such that it enables increased feed whilst maintaining good surface finish.

The invention will be described in more detail in the following with reference to the enclosed drawings, wherefrom the features of the invention will become apparent.

Fig. 1 is a plan view of a portion of an indexable insert according to the invention.
Fig. 2 is a side view of the cutting insert in Fig. 1.
Fig. 3 is an enlarged detailed view of the corner of an insert according to Figs. 1-2.
Fig. 4 is a view showing a tool with the cutting insert of Figs. 1-3 during copy turning inwards of a work piece.
Fig. 5 shows a sectional view along the line V-V in Fig. 1 and
Fig. 6 is a sectional view along the line VI-VI in Fig. 1.

Figs. 1-3 show a cutting insert 10 for copying turning according to the invention with triangular basic form. The cutting insert is generally made of cemented carbide but can also be made of other ceramic materials. The insert comprises flat top and bottom surfaces 11 and 12, which are mutually parallel and which form a right angle with the edge surfaces which are designated 13, 14 and 15 and interconnected by curved corner portions. In the embodiment shown in Figs. 1-3 the edge surfaces are oriented in a plane perpendicular to the plane that includes flat surfaces 11 and 12. The insert additionally includes a plurality of cutting edges 18, 19 which, provide intersections between the edge surfaces 13, 14, 15 and the top surface 11. The insert can alternatively have positive basic shape wherein the edge surfaces intersect with the top surface at an acute angle. The insert has a central hole 16 for the receipt of a pin or a centre screw (not shown) for the clamping of the insert into a belonging tool holder 17 (Fig. 4).

In Fig. 1 the edge surfaces extending towards an acute angled corner are designated 13 and 14, with the embodiment shown in Fig. 1 the edge 18 represents a secondary cutting

edge and the edge 19 represents a main cutting edge between which then is an asymmetric curved corner region including a radial edge 20 on one side of the bisector B intended to serve as a wiper edge and on opposite side of said bisector there is a corner edge 21 adjacent to the main cutting edge 19. It is to be understood that the insert must have such inclination that a clearance angle is obtained at the main cutting edge and at the secondary cutting edges 18, 19 and at the corner region therebetween. This will enable the edge portion 20 to be used as an edge for inwards copying such that when facing at for example 90° a large cut can be taken while the length of the edges 18 need not be specifically great. The insert is at all cutting edge portions provided with a land 22 which extends all around the insert whilst oriented substantially perpendicular towards the edge surface 13, 14, 15.

According to the invention the radial edge 20 is provided with a size of radius that is at least five times larger than the size valid for the corner edge 21 located on the opposite side of said bisector B, said corner edge being a transition to the main cutting edge 19. A further characteristic feature is that the main cutting edge 19 extends in a longitudinal direction such that it includes an angle of 80-135° together with radial edge 20.

The transition between the primary radial edge 20 and the corner edge 21 is in the form of a secondary radial edge 23, the size of which ought to be less than the radial edge 24 that represents a transition between the primary radial edge 20 and the secondary cutting edge 18. The relation should preferably be such that the size of radius of radial edge 23 is about half the size of radial edge 24 located next to the secondary edge 18. At same time a transition radial edge 25 ought to be provided between the corner edge 21 and the main cutting edge 19, the radius of which ought to be of same size as the size of the radius of radial edge 24 located next to the secondary edge 18. As regards the width of the land 22 along radial edge 20 and along the remainder of the insert it has been found suitable to select the width of said land 22 along radial edge 20 such that it amounts to 50-70 % of the width of the land 22 along the corner cutting edge 21.

A sloping surface or downwards inclined surface 26 extends from the inner limiting edge of each land 22 and extends into a secondary sloping surface 27 which is located at

the corner area. This secondary sloping surface 27 extends into a planar central floor surface 28 of triangular basic shape whilst plane parallel with the bottom face 12 of the insert. The angle of inclination α of said sloping surface 26 ought to be in the area 10-30° whereas the angle of inclination of the secondary sloping surface 27 ought to be 0-15°.

Each land 22 is planar and includes a raised land area, which in a direction away from the corner area extends into an inclined land area. A characteristic feature of the invention is that said land area 22 includes an area 22' with smaller width along the radial edge 20 which then successively appears with larger width which is uniform both along the corner cutting edge 21 as well as along the entire main cutting edge 19. At the same time as this brings about a purposeful enforcement of the cutting edge this simultaneously enables reducing the contact between the chips and the insert's surface such that the crater wear effect can be timely deferred.

In order to furthermore improve chipbreaking and deflecting the chip obtained during turning and copying a chip former is provided in the corner region. This chipformer is provided in the shape of an inclined plateau 27 that is depressed in relation to the edge portions, the confining side surfaces of which converge towards the corner with an asymmetric configuration in relation to the bisector. More specifically the shape is such that an essentially sine-formed side edge 29 located on same side of the bisector B as the primary radial edge 20 gets a termination in the form of an inclined primary edge 30 which extends parallel with radial edge 20 and then provides an obtuse angled corner 31 and then extends into a secondary edge 32 in opposite direction whereby said bisector B intersects said latter edge approximately in the middle thereof. The last mentioned secondary edge 32 provides in its turn an obtuse angled corner 33 together with the forward termination of another mainly sine-formed side edge 34 which represents a side confining edge of the plateau 27.

Thanks to the above defined radial differentiation in the corner region of the insert a surprisingly good surface smoothness of the machined surface has been achieved in comparison with a similar insert of constant corner radius, and the insert has

additionally been found less sensible to how the setting angle is provided compared with a corresponding insert with a straight wiper edge. Due to the above optimized shape of the chipformer in combination with the shape of said land 22 it has simultaneously been possible to increase the feed with 20-100 % whilst maintaining the profile depth of the generated surface.

In Fig. 4 it is shown how the illustrated embodiment of the insert is used for copying inwards with the insert clamped into a belonging toolholder 17 whereby the direction of machining is designated P on the workpiece A.

In order to achieve optimized chip control the radii of the various radial edges should lie in the following intervals:

20: 5-30 mm, preferably 10-20 mm
21: 0.2-3.2 mm, preferably 0.4-1.6 mm
23: 0.2-1.6 mm, preferably 0.4-1.2 mm
24: 0.6-2.4 mm, preferably 0.8-1.6 mm
25: 1.6-30 mm, preferably 5-20 mm

Claims

1. An indexable cutting insert for turning having generally polygonal shape, including an upper surface (11) and a bottom surface (12) and these interconnecting edge surfaces (13, 14, 15) at least apart of the intersecting lines between the edge surfaces and the upper surface forming at least a main cutting edge (19), a secondary cutting edge (18) and a curved corner region therebetween which is asymmetric and divided into a plurality of circular segments which at the intersection line with the upper surface form edge portions wherein immediately adjacent ones of the circular segments being of mutually different radii, a secondary cutting edge (18) extends adjacent to a radial edge (20) which is located on same side of the bisector as the main cutting edge and appears with a radius of curvature, the size of said radius being at least 5 times larger than the corner edge (21) located on opposite side of the bisector and which provides a transition to the main cutting edge (19), c h a r a c t e r i z e d in, that

a) the insert is in the shape of a regular polygon-shaped body,

b) that the transition surface between the cutting edges (17, 18) and the top surface (11) is in the shape of an edge reinforcing land (22) of such shape that the width of the land portion (22') along the secondary cutting edge (20) on one side of the bisector (B) is smaller than the width of the land (22) along the curved corner cutting edge (21) located on opposite side of the bisector (B).

2. Indexable insert according to claim 1, c h a r a c t e r i z e d in, that the width of the edge reinforcing land (22) is the same along the curved corner cutting edge (21) as well as along the straight secondary cutting edge (18).

3. Indexable insert according to any of the claims 1-2, c h a r a c t e r i z e d in, that the width of the land (22) along the secondary cutting edge (20) constitutes 50-70 % of the width of the land along the corner cutting edge (21).

4. Indexable insert according to any of the claims 1-3, characterized in, that the insert in the corner region at a certain distance from the land (22) appears with a planar inclined surface (27) that is depressed in relation to the edges whilst being confined by sine-formed side confining edges (29, 34) which converge outwards towards the cutting corner.

5. Indexable insert according to claim 4, characterized in, that the sine-formed side limiting edge (29) on one side of the bisector (B) extends into a mainly straight primary edge (30) which entirely is located on one side of the bisector (B) parallel with the extension of the radial edge (20).

6. Indexable insert according to claims 4 or 5, characterized in, that the straight edge (30) extends via an obtuse angled corner (31) into another straight edge (32) which is intersected by the bisector (B).

7. Indexable insert according to claim 6, characterized in, that the bisector (B) is intersecting the straight secondary edge (32) mainly in the middle thereof.

1/2

Fig. 1

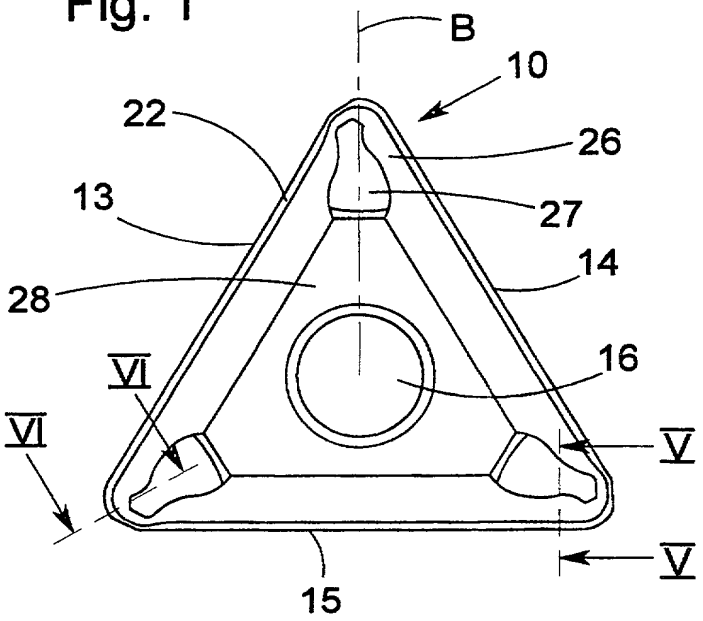


Fig. 2

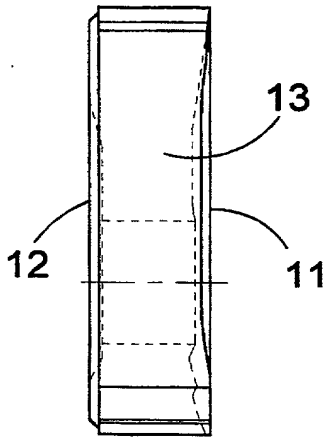


Fig. 3

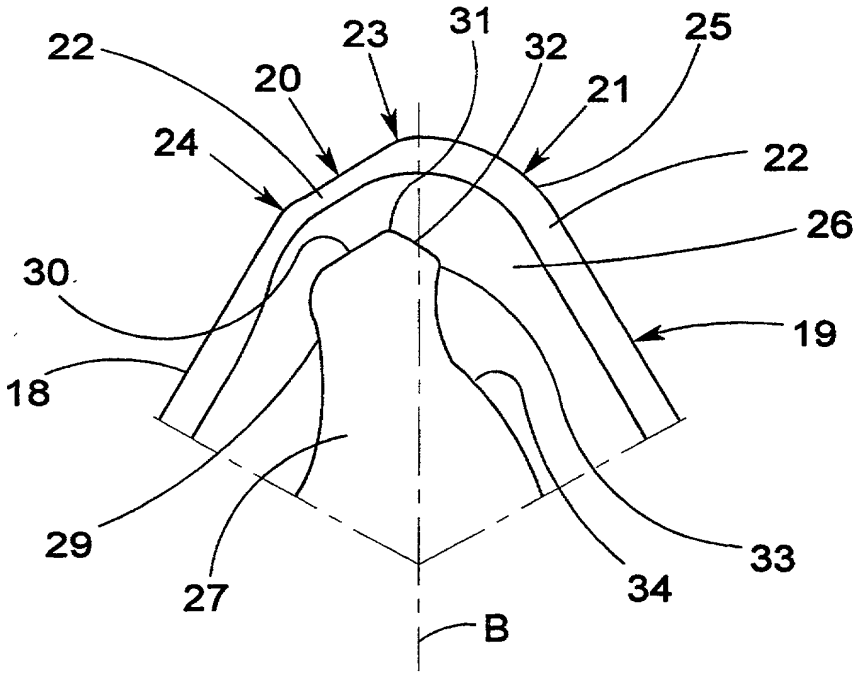


Fig. 4

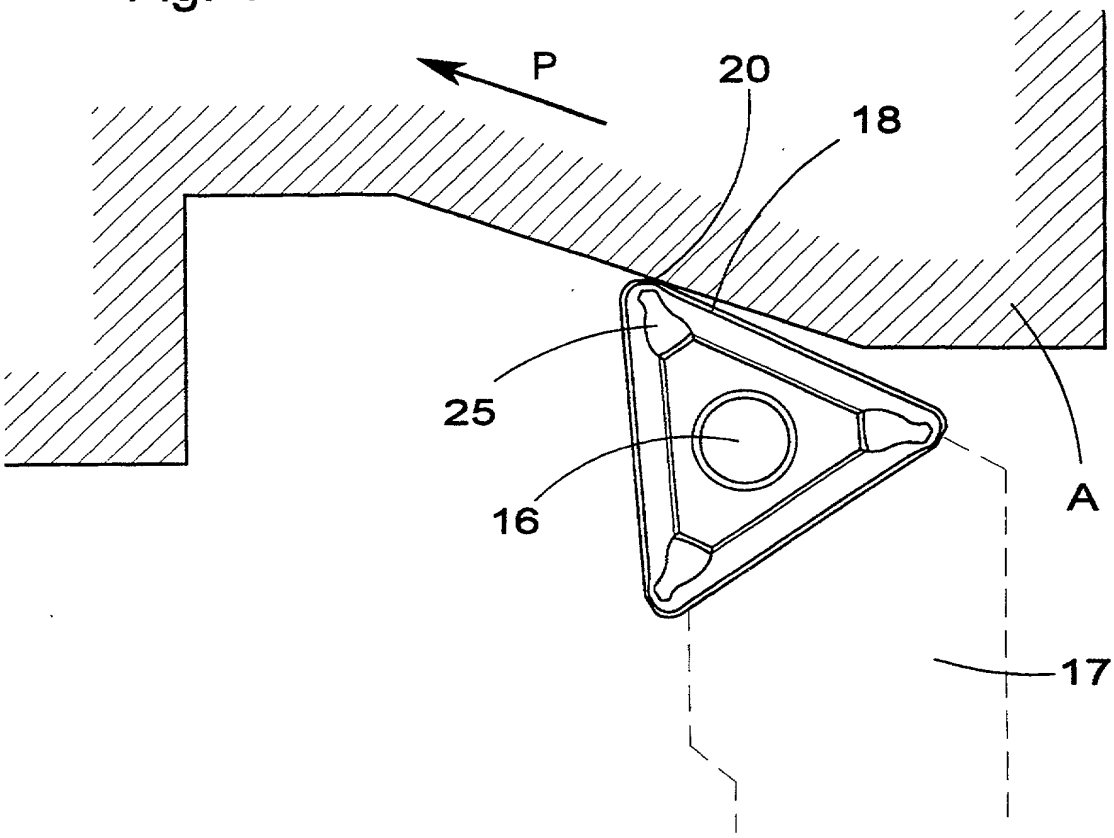


Fig. 5

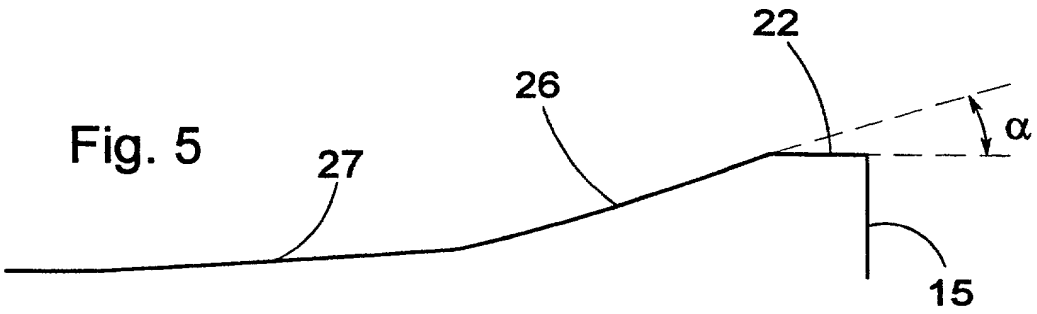
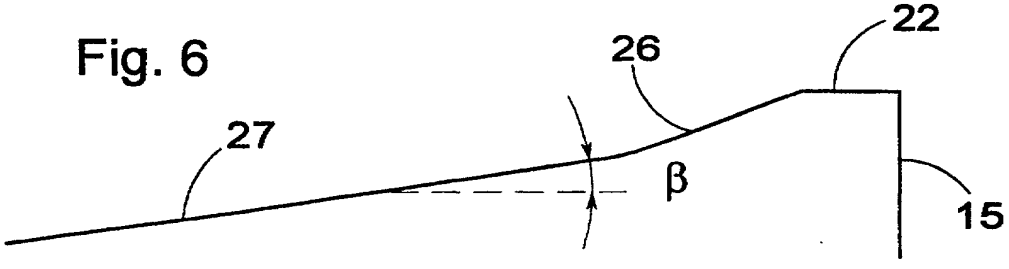


Fig. 6



CUTTING INSERT FOR TURNING

Background of the Invention

0001] The present invention relates to an indexable insert for turning which cutting insert has a polygonal basic form including an upper surface, and a bottom surface. The top and bottom surfaces are interconnected by side surfaces, wherein at least a part of the intersection lines between the side surfaces and the upper surface forms at least one main cutting edge, a secondary cutting edge and a curved corner cutting edge therebetween.

0002] For copy turning nowadays, to a large extent, indexable inserts are used with nose point angles below 60°, wherein an ordinary value of the nose point angles is 55°, which enables application of the cutting inserts within a broad range. On the market nowadays a number of different types of indexable inserts with 55° nose point angle are found, among which types rhomboidic, rhombic and regular triangular indexable inserts can be mentioned.

0003] In copy turning the following properties regarding feature and economy are desirable:

0004] 1) Good chip control, i.e. favourable chip guidance and chip breaking.

0005] 2) No movement of the cutting insert under impact of cutting forces.

0006] When copy turning inwards in certain materials or in slender work pieces and also in usage on unsteady machines and in internal metal working, low cutting forces and preferably a positive chip angle on the copying insert are also desirable. Simultaneously there is a demand in modern machines that the copy turning insert to be used will be able to give the best possible surface finish of the machined surface. Sometimes the

surface finish can be improved by using higher cutting speed and neutral or positive rake angles.

Objects and Summary of the Invention

0007] It is a first purpose of the invention to achieve a new and improved indexable insert for copy turning having a new type of wiper edge in the corner region which enables attainment of improved surface finish of the machined surface.

0008] It is a second purpose to achieve an insert with a rake face in the corner area that brings about a favourable influence on the cutting force and the tool wear.

0009] It is a third purpose to achieve an insert that is modified such that it enables increased feed whilst maintaining good surface finish.

0010] The present invention relates to an indexible cutting insert having a polygonal shape and including an upper surface, a lower surface, and an edge surface structure interconnecting the upper and lower surfaces. An intersection between the edge surface structure and the top surface forms: a main cutting edge, a secondary cutting edge, and a curved corner region disposed between the main and secondary cutting edges. The corner region includes a radial edge and a corner edge of mutually different radii of curvature. The radial edge and the secondary cutting edge are disposed on a first side of a bisector of the corner region. The corner edge and the main cutting edge are located on a second side of the bisector. A radius of curvature of the radial edge is at least five times larger than a radius of curvature of the curved edge. The top surface includes an edge-reinforcing land extending along the radial edge and the curved edge. A portion of the land extending along the radial edge being of smaller width than a portion of the land extending along the curved edge.

Brief Description of the Drawings

0011] The invention will be described in more detail in the following with reference to the enclosed drawings, wherefrom the features of the invention will become apparent.

0012] Fig. 1 is a plan view of a portion of an indexable insert according to the invention.

0013] Fig. 2 is a side view of the cutting insert in Fig. 1.

0014] Fig. 3 is an enlarged detailed view of the corner of an insert according to Figs. 1-2.

0015] Fig. 4 is a view showing a tool with the cutting insert of Figs. 1-3 during copy turning inwards of a work piece.

0016] Fig. 5 shows a sectional view along the line V-V in Fig. I and

0017] Fig. 6 is a sectional view along the line VI-VI in Fig. 1.

Detailed Description of Preferred Embodiment of the Invention

0018] Figs. 1-3 show a cutting insert 10 for copying turning according to the invention with triangular basic form. The cutting insert is generally made of cemented carbide but can also be made of other ceramic materials. The insert comprises flat top and bottom surfaces 11 and 12, which are mutually parallel and which form a right angle with the edge surfaces which are designated 13, 14 and 15 and interconnected by curved corner portions. In the embodiment shown in Figs. 1-3 each of the edge surfaces is oriented in a plane perpendicular to the planes that include the flat surfaces 11 and 12. The insert additionally includes a plurality of cutting edges 18, 19 which provide intersections between the edge surfaces 13, 14, 15 and the top surface 11. The insert can alternatively have positive basic shape wherein

the edge surfaces intersect with the top surface at an acute angle. The insert has a central hole 16 for the receipt of a pin or a centre screw (not shown) for the clamping of the insert into a belonging tool holder 17 (Fig. 4).

0019] In Fig. 3 the edge 18 represents a secondary cutting edge and the edge 19 represents a main cutting edge between which there is an asymmetric curved corner region including a radial edge 20 on one side of the bisector B intended to serve as a wiper edge and on opposite side of said bisector there is a corner edge 21 adjacent to the main cutting edge 19. It is to be understood that the insert must have such inclination that a clearance angle is obtained at the main and secondary cutting edges 18, 19 and at the corner region therebetween. This will enable the edge portion 20 to be used as an edge for inwards copying such that when facing at for example 90° a large cut can be taken while the length of the edges 18 need not be specifically great. The insert is provided at all cutting edge portions with a land 22 which extends all around the insert whilst oriented substantially perpendicular towards the edge surface 13, 14, 15.

0020] According to the invention the radial edge 20 is provided with a radius that is at least five times larger than the size valid for the corner edge 21 located on the opposite side of said bisector B, said corner edge being a transition to the main cutting edge 19. A further characteristic feature is that the main cutting edge 19 extends in a longitudinal direction such that it includes an angle of 80-135° together with radial edge 20.

0021] The transition between the primary radial edge 20 and the corner edge 21 is in the form of a secondary radial edge 23, the size of which ought to have a radius less than that of the radial edge 24 that represents a transition between the primary radial edge 20 and the secondary cutting edge 18. The relation should preferably be such that the size of the radius

of radial edge 23 is about half the size of the radius of radial edge 24 located next to the secondary edge 18. At the same time, a transition radial edge 25 ought to be provided between the corner edge 21 and the main cutting edge 19, the radius of which ought to be of same size as the size of the radius of radial edge 24 located next to the secondary edge 18. As regards the width of the land 22 along radial edge 20 and along the remainder of the insert, it has been found suitable to select the width of the portion of said land 22 that extends along radial edge 20 such that it amounts to 50-70 % of the width of the portion of the land 22 that extends along the corner cutting edge 21.

0022] A sloping surface or downwards inclined surface 26 extends from the inner limiting edge of each land 22 and extends into a secondary sloping surface 27 which is located at the corner area. This secondary sloping surface 27 extends into a planar central floor surface 28 of triangular basic shape while oriented plane parallel with the bottom face 12 of the insert. The angle of inclination a of said sloping surface 26 ought to be in the range of 10-30° whereas the angle of inclination of the secondary sloping surface 27 ought to be 0-15°.

0023] Each land 22 is planar and includes a raised land area, which in a direction away from the corner area extends into an inclined land area. A characteristic feature of the invention is that said land area 22 includes an area 22' with smaller width along the radial edge 20 which then successively appears with larger width which is uniform both along the corner cutting edge 21 as well as along the entire main cutting edge 19. At the same time as this brings about a purposeful enforcement of the cutting edge, this simultaneously enables reducing the contact between the chips and the insert's surface such that the crater wear effect can be timely deferred.

0024] In order to furthermore improve chipbreaking and deflection of the chip obtained during turning and copying, a chip former is provided in the corner region. This chipformer is provided in the shape of an inclined plateau 27 that is depressed in relation to the edge portions, the confining side surfaces of which converge towards the corner with an asymmetric configuration in relation to the bisector. More specifically the shape is such that an essentially sine wave-shaped side edge 29 located on same side of the bisector B as the primary radial edge 20 gets a termination in the form of an inclined primary edge 30. That edge 30 extends parallel with the radial edge 20 and then provides an obtuse angled corner 31 and then extends into a secondary edge 32 in the opposite direction whereby said bisector B intersects said latter edge approximately in the middle thereof. The last mentioned secondary edge 32 provides in its turn an obtuse angled corner 33 together with the forward termination of another mainly sine wave-shaped side edge 34 which represents a side confining edge of the plateau 27.

0025] Thanks to the above defined radial differentiation in the corner region of the insert a surprisingly good surface smoothness of the machined surface has been achieved in comparison with a similar insert of constant corner radius, and the insert has additionally been found less sensible to how the setting angle is provided compared with a corresponding insert with a straight wiper edge. Due to the above optimized shape of the chipformer in combination with the shape of said land 22 it has simultaneously been possible to increase the feed by 20-100% whilst maintaining the profile depth of the generated surface.

0026] In Fig. 4 it is shown how the illustrated embodiment of the insert is used for copying inwards with the insert clamped into an associated

toolholder 17 whereby the direction of machining is designated P on the workpiece A.

0027] In order to achieve optimized chip control the radii of the various radial edges should lie in the following intervals:

0028] 20: 5-30 mm, preferably 10-20 mm

21: 0.2-3.2 mm, preferably 0.4-1.6 mm

23: 0.2-1.6 mm, preferably 0.4-1.2 mm

24: 0.6-2.4 mm, preferably 0.8-1.6 mm

25: 1.6-30 mm, preferably 5-20 mm

СОЮЗ СОВЕТСКИХ СОЦИАЛИСТИЧЕСКИХ РЕСПУБЛИК

(19) SU (11) 1798045 A1

ГОСУДАРСТВЕННОЕ ПАТЕНТНОЕ ВЕДОМСТВО СССР (ГОСПАТЕНТ СССР)

(51)5 B 23 B 27/16, 27/00

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

(21) 4952640/08
(22) 28.06.91
(46) 28.02.93. Бюл. № 8
(71) Всесоюзный научно-исследовательский и проектный институт тугоплавких металлов и твердых сплавов
(72) А.И.Пьянов, Н.С.Кучеренко, А.А.Дальский и В.И.Войцеховский
(56) Патент США
№ 4247232, кл. 407-114, 1981.

(54) РЕЖУЩАЯ ПЛАСТИНА

(57) Использование: в машиностроении, а именно в механообработке, в токарных резцах для обработки материалов. Режущая пластина в виде многогранника содержит переднюю и расположенную к ней под углом заднюю поверхность, режущие кромки, упрочняющую фаску, наклонную к плоскости расположения режущих кромок, и стружколомающую канавку. Упрочняющая фаска выполнена в виде трех участков, угол наклона которых к плоскости расположения режущих кромок определяется соответственно соотношениями: $-5 \le \gamma_1 \le +15$; $\gamma_2 = \gamma_1 + \alpha$; $\gamma_3 = (2\gamma_1 + \alpha) : 2$, где γ_1 – угол наклона 1-го участка фаски, прилегающей к режущей кромке; γ_2 – угол наклона среднего участка фаски; γ_3 – угол наклона третьего участка фаски; α – задний угол пластины. Третий участок упрочняющей фаски выполнен большей ширины, чем первые два участка. 2 ил., 1 табл.

Целью изобретения является повышение стойкости режущих пластин путем выполнения передней поверхности пластины, обеспечивающей необходимую прочность режущего клина инструмента в зависимости от величины действующей нагрузки.

Это достигается за счет того, что в режущей пластине, выполненной в виде многогранника и имеющей переднюю и расположенную под углом к ней заднюю поверхности, режущие кромки, упрочняющую фаску, наклонную к плоскости расположения кромок, и стружколомающую канавку, расположенные по периметру на передней поверхности, уплотняющая фаска выполнена в виде трех участков, угол наклона которых к плоскости расположения режущих кромок определяется соответственно соотношениями

$$-5^\circ \le \gamma_1 \le +15^\circ; \gamma_2 = \gamma_1 + \alpha;$$
$$\gamma_3 = \frac{2\gamma_1 + \alpha}{2}$$

где γ_1 – угол наклона первого участка фаски, прилегающего к режущей кромке;

γ_2 – угол наклона среднего участка фаски (второго);

γ_3 – угол наклона третьего участка;

α – задний угол пластины.

При этом третий участок упрочняющей фаски выполнен большей ширины, чем первые два.

(19) SU (11) 1798045 A1

Выполнение упрочняющей фаски в виде трех участков позволяет повысить стойкость режущей пластины за счет распределения действующих в процессе резания нагрузок на переднюю поверхность при обеспечении прочности режущего клина.

Снижение действующих нагрузок при обеспечении прочности режущего клина в различные моменты резания обеспечивается выполнением участков фаски под соответствующими углами наклона γ_1, γ_2 и γ_3 к плоскости расположения режущих кромок. Значения углов γ_1,γ_2, γ_3 определены экспериментальным путем. Увеличение угла наклона первого участка фаски γ_1 выше +15° приводит к снижению прочности режущего клина и увеличению износа и скола режущей кромки инструмента. Уменьшение угла γ_1 ниже -5° приводит к увеличению сил резания и повышенному износу режущей кромки.

Изменение отношения $\gamma_2 = \gamma_1 + \alpha$ в сторону увеличения угла наклона второго участка фаски γ_2 приводит к потере прочности режущего клина, в сторону уменьшения γ_2 – к повышению сил резания.

В обоих случаях увеличивается износ инструмента. Изменение соотношения $\gamma_3 = \frac{2\gamma_1 + \alpha}{2}$ в сторону увеличения угла наклона третьего участка фаски γ_3 приводит к потере прочности режущего клина и ухудшению теплоотвода из зоны резания, в сторону уменьшения γ_3 – к увеличению сил резания и интенсивному износу инструмента. Ширина участков упрочняющей фаски зависит от износа h_3 инструмента по задней поверхности и рассчитывается по формуле $C = h_3 \cdot \operatorname{tg}\alpha$, где α – задний угол.

Ширина C_1 первого участка фаски ограничена окончанием периода приработки инструмента, который составляет обычно h_3 = =0,2–0,25 мм и равна C_1 = 0,04–0,06 мм.

Ширина C_2 второго участка фаски ограничена окончанием периода нормального износа пластины h_3 = 0,45–0,55 мм и равна C_2 = 0,04–0,06 мм.

Ширина C_3 третьего участка фаски составляет 0,04–0,2 мм и выбирается в соответствии с величиной критерия затупления пластины, который для жаропрочных материалов составляет h_3 = 0,6–0,8 мм, а для конструкционных сталей h_3 = 0,8–1,5 мм.

При ширине C_1 первого участка фаски 0,04 мм происходит потеря прочности режущего клина. Дальше 0,06 – увеличиваются силы резания и износа пластины.

При ширине 2-го участка фаски меньше 0,04 мм происходит увеличение сил резания в связи со смещением первого и третьего участка фаски. Больше 0,06 мм происходит потеря прочности режущего клина и увеличивается износ инструмента.

При ширине третьего участка выше 0,2 мм ухудшает отвод и завивание стружки, а также увеличивает силы резания. Уменьшение ширины больше 0,04 мм приводит к потере прочности режущего клина, что снижает общую стойкость инструмента.

В целом все отличительные признаки позволяют повысить стойкость режущей пластины.

На фиг. 1 – вид пластины, план; на фиг. 2 – сечение А-А на фиг. 1.

Режущая пластина в виде многогранника содержит переднюю 1 и расположенную под углом α к ней заднюю 2 поверхности, режущие кромки 3, упрочняющую фаску 4, наклоненную к плоскости расположения режущих кромок 3 и стружколомающую канавку 5, расположенные по периметру на передней поверхности 1. Упрочняющая фаска 4 выполнена в виде трех участков, угол наклона которых к плоскости расположения режущих кромок 3 определяется соответственно соотношениями

$$-5^\circ \le \gamma_1 \le +15^\circ; \gamma_2 = \gamma_1 + \alpha;$$
$$\gamma_3 = \frac{2\gamma_1 + \alpha}{2},$$

где γ_1 – угол наклона первого участка 6 фаски 4, прилегающего к режущей кромке 3;

γ_2 – угол наклона среднего участка 7 фаски 3;

γ_3 – угол наклона третьего участка 8 фаски 3;

α – задний угол пластины.

При этом третий участок упрочняющей фаски 4 выполнен большей ширины C_3 чем первые два участка.

Перед началом работы режущая пластина крепится на державке резца (не показано). В начале работы нагрузку воспринимает первый участок упрочняющей фаски 4. В этот момент (период приработки) необходимая прочность пластины обеспечивается выполнением упрочняющей фаски 4 под углом наклона γ_1 к плоскости расположения режущих кромок 3 в пределах от -5 до +15° на ширине C_1 = 0,04–0,06 мм. По мере износа пластины возрастают силы резания и в работу вступает второй участок упрочняющей фаски 4, при этом прочность режущего клина обеспечивается выполнением угла наклона этого участка, равным $\gamma_2 = \gamma_1 + \alpha$, на ширине фаски C_2 = 0,04–0,06 мм. Когда действующие нагрузки начинают

значительно увеличиваться – начало участка повышенного износа – работает третий участок упрочняющей фаски 4. Его прочность обеспечивается выполнением угла наклона фаски в пределах $\gamma_3 = \frac{2\gamma_1 + \alpha}{2}$ на ширине 0,04–0,2 мм.

Такое конструктивное выполнение упрочняющей фаски на режущей пластине позволяет рационально распределить действующие нагрузки в процессе резания, снизить износ сколы и поломки пластины, и, тем самым увеличить ее общую стойкость.

Пример. Проводились испытания резцов с механическим креплением режущих пластин из материала ВК100М, на токарном станке 16к20.

Параметры пластины при обработке сплава на никелевой основе марки ЭИ698 определялись следующим образом (пример 4): упрочняющая фаска выполнялась в виде трех наклонных участков, угол наклона первого участка, прилегающего к режущей кромке был взят равным +10°, т.е. $\gamma_1 = +10°$, задний угол $\alpha = 12°$. Угол наклона среднего участка фаски определялся из соотношения

$$\gamma_2 = \gamma_1 + \alpha = +10° + 12° = 22°.$$

Угол наклона третьего участка фаски

$$= \frac{2\gamma_1 + \alpha}{2} = \frac{2(+10°) + 12°}{2} = 16°$$

При этом ширина каждого участка фаски соответственно равна: $C_1 = 0,04$ мм, $C_2 = 0,05$ мм, $C_3 = 0,08$ мм.

В остальных случаях расчет производился аналогично.

Результаты эксперимента приведены в таблице.

Для сравнения применялись серийные конструкции пластин по ГОСТ 19047-82 п. 11–14 с плоской передней поверхностью и углом $\gamma = 0°$, п. 15 – резец, оснащенный пластиной с шириной фаски $C_1 = 0,1$ мм, передним углом фаски $\gamma = -7°$ углом наклона стружкоотводной канавки $\gamma = 11°$.

Результаты испытаний показали, что стойкость пластины предложенной конструкции в 3–3,5 раза больше по сравнению с базовым объектом.

Формула изобретения

Режущая пластина в виде многогранника с передней и расположенной под углом к ней задней поверхностями и режущими кромками с упрочняющей фаской, наклоненной к плоскости расположения режущих кромок, и стружколомающей канавкой, отличающаяся тем, что, с целью повышения стойкости за счет обеспечения прочности режущего клина, упрочняющая фаска выполнена в виде трех участков, угол наклона которых к плоскости расположения режущих кромок определяется соответственно:

$$-5° \le \gamma_1 \le 15°; \gamma_2 = \gamma_1 + \alpha; \gamma_3 = (2\gamma_1 + \alpha)/2,$$

где γ_1 – угол наклона первого участка фаски, прилегающего к режущей кромке;

γ_2 – угол наклона среднего участка фаски;

γ_3 – угол наклона третьего участка фаски;

α – задний угол пластины,

при этом третий участок упрочняющей фаски выполнен большей ширины, чем первые два.

Обрабатываемый материал	Скорость резания, v, м/мин	Подача, мм/об, $S_в$	Глубина t, мм	Длина участков фаски			Геометрия инструмента				Стойкость пластины, $T_{мин}$
				C_1	C_2	C_3	γ_1	γ_2	γ_3	α	
ЭИ648	35	0,2	2	0,04	0,05	0,08	+15	+27	+21	12	75
"	"	"	"	"	"	"	+17	+29	+23	"	32
"	"	"	"	"	"	"	+19	+31	+25	"	18
ЭИ698	25	0,2	1	"	"	"	+10	+22	+16	"	68
"	"	"	"	"	"	"	-10	+2	-4	"	15
ВТ3-1	75	0,2	1	"	"	"	+8	+20	+14	"	62
"	"	"	"	0,02	"	"	"	"	"	"	43
"	"	"	"	0,04	0,07	"	+5	+17	+11	"	48
"	"	"	"	"	0,05	0,2	0	+12	+6	"	50
ЭП742	15	0,2	2	0,05	0,06	0,1	-5	+7	+1	"	44
"	"	"	"	"	"	"	-7	5	-1	"	21
ЭИ698	25	0,2	1				0			"	18
ЭИ648	35	0,2	2				0			"	24
ВТ3-1	75	0,2	1				0			"	25
ЭП742	15	0,2	2				0			"	1515
ЭИ698	25	0,2	1		0,1		-7	+11		7	

Fig. 1

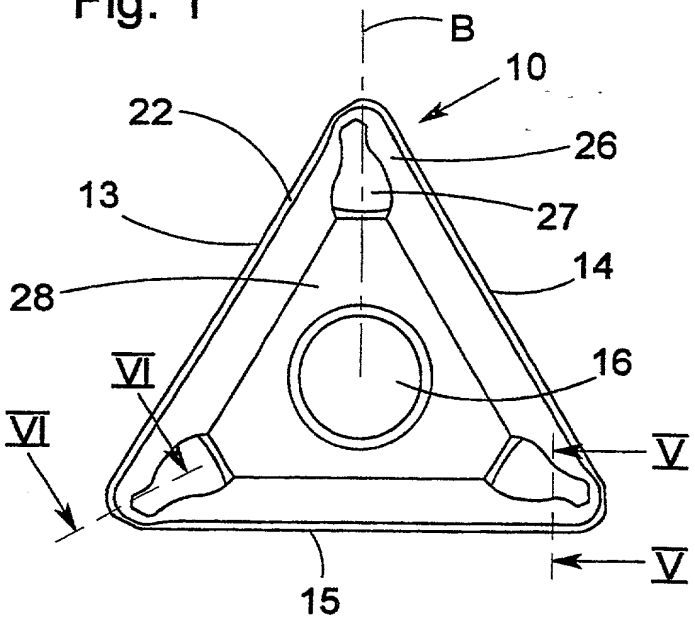


Fig. 2

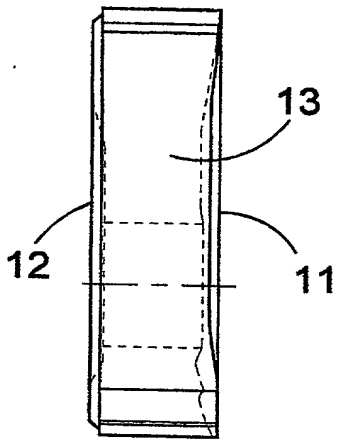
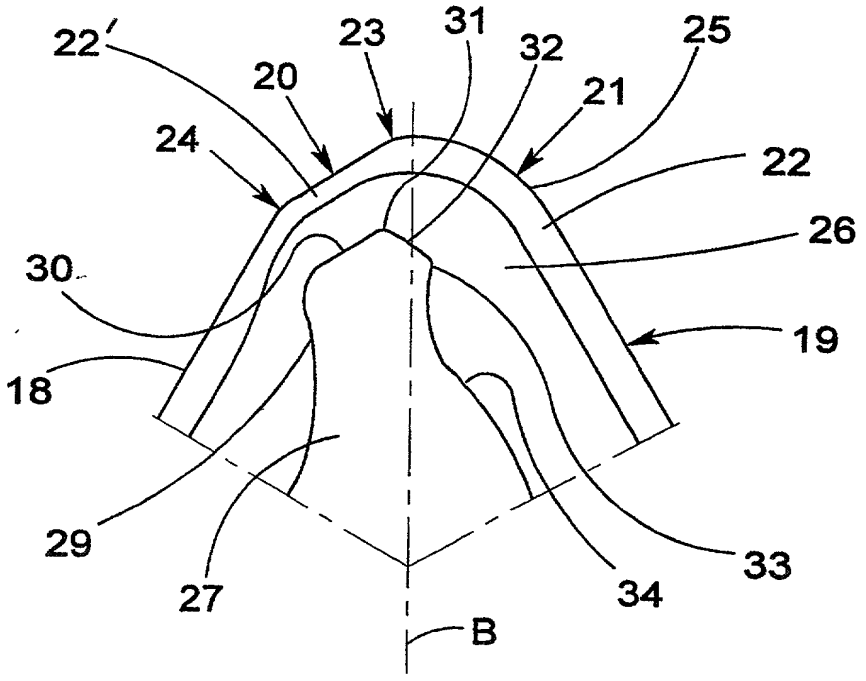
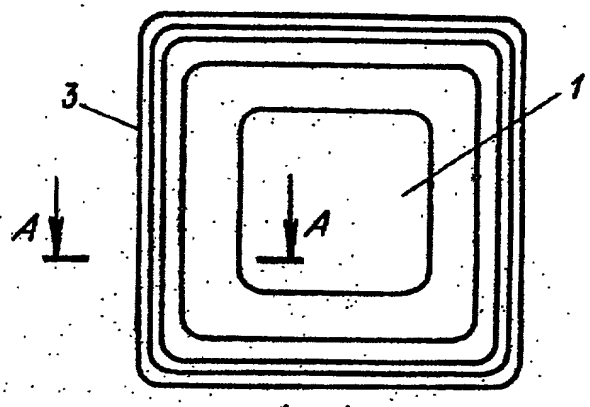
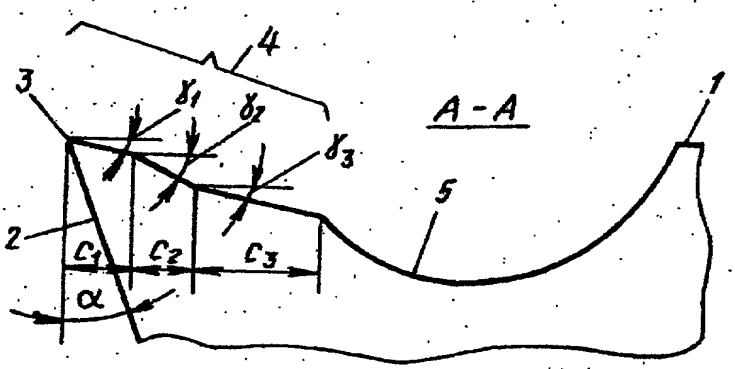


Fig. 3





Фиг.1



Фиг.2

Составитель А.Пьянов
Редактор Техред М.Моргентал Корректор А.Обручар

Заказ 736 Тираж Подписное
ВНИИПИ Государственного комитета по изобретениям и открытиям при ГКНТ СССР
113035, Москва, Ж-35, Раушская наб., 4/5

Производственно-издательский комбинат "Патент", г. Ужгород, ул.Гагарина, 101

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D) (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 024444-954

I hereby claim the benefit under Title 35, United States Code, §120 of any United States applications(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. §120:

U.S. APPLICATIONS		STATUS *(check one)*		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. APPLICATION NUMBERS ASSIGNED (if any)			
PCT/SE00/00262	10/02/2000	09/913,508		✓	

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

William L. Mathis	17,337	Eric H. Weisblatt	30,505	Bruce T. Wieder	33,815
Robert S. Swecker	19,885	James W. Peterson	26,057	Todd R. Walters	34,040
Platon N. Mandros	22,124	Teresa Stanek Rea	30,427	Ronni S. Jillions	31,979
Benton S. Duffett, Jr.	22,030	Robert E. Krebs	25,885	Harold R. Brown III	36,341
Norman H. Stepno	22,716	William C. Rowland	30,888	Allen R. Baum	36,086
Ronald L. Grudziecki	24,970	T. Gene Dillahunty	25,423	Brian P. O'Shaughnessy	32,747
Frederick G. Michaud, Jr.	26,003	Patrick C. Keane	32,858	Kenneth B. Leffler	36,075
Alan E. Kopecki	25,813	B. Jefferson Boggs, Jr.	32,344	Fred W. Hathaway	32,236
Regis E. Slutter	26,999	William H. Benz	25,952	Wendi L. Weinstein	34,456
Samuel C. Miller, III	27,360	Peter K. Skiff	31,917	Mary Ann Dillahunty	34,576
Robert G. Mukai	28,531	Richard J. McGrath	29,195		
George A. Hovanec, Jr.	28,223	Matthew L. Schneider	32,814		
James A. LaBarre	28,632	Michael G. Savage	32,596		
E. Joseph Gess	28,510	Gerald F. Swiss	30,113		
R. Danny Huntington	27,903	Charles F. Wieland III	33,096		

21839

and: _____

Address all correspondence to:

21839

Ronald L. Grudziecki, Esq.
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, Virginia 22313-1404

Address all telephone calls to: Alan E. Kopecki at (703) 836-6620.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D) (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 024444-954

FULL NAME OF SOLE OR FIRST INVENTOR Jörgen WIMAN	SIGNATURE Jörgen Wiman	DATE 26/9-01
RESIDENCE Sandviken, SWEDEN	CITIZENSHIP SWEDEN	
POST OFFICE ADDRESS Kurrasbacken 11, S-811 52 Sandviken, SWEDEN SE		
FULL NAME OF SECOND JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		
FULL NAME OF THIRD JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		
FULL NAME OF FOURTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		
FULL NAME OF FIFTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		
FULL NAME OF SIXTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY **(Includes Reference to Provisional and PCT International Applications)**	Attorney's Docket No. **024444-954**

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

CUTTING INSERT FOR TURNING

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application
Number _____
on _____
and was amended
on _____ (if applicable).

☑ was filed as PCT international application
Number PCT/SE00/00262
on February 10, 2000
and was amended
on March 26, 2001 (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. §119
SWEDEN	9900528-2	15/02/1999	✓ Yes _No
			_ Yes _No
			_ Yes _No
			_ Yes _No
			_ Yes _No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

_____ _____
(Application Number) (Filing Date)

_____ _____
(Application Number) (Filing Date)